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United States Department of Agriculture.

DIVISION OF BOTANY.

THE FLAT PEA.

DESCRIPTION.

The wood pea (*Lathyrus sylvestris*),[1] of which the flat pea is a variety, is not very different in appearance from the common garden pea or the

FIG. 1.—Flat Pea (*Lathyrus sylvestris wagneri*).

ornamental sweet pea. It is a perennial, enduring sometimes for twenty-five years or more. It has a strong, deep, much-branched root,

[1] *Technical description.*—Perennial, whole plant smooth and glabrous, glaucous; root stout and deep, the taproot sending out clusters of strong fibers; stems sometimes 6 feet long (in cultivation often considerably longer), narrowly winged on the angles; stipules long, narrow, sagittate; petioles usually winged, terminating in a slender branched tendril; leaflets one pair, narrowly lanceolate, 4 to 6 inches long; peduncles 4 to 6 inches or more in length, bearing 3 to 10 flowers in a loose raceme; flowers rather large, two-thirds to three-quarters inch long, on pedicels somewhat exceeding the calyx, bracts filiform; calyx with a short, broad tube and 5 triangular teeth; standard of corolla broad, rose pink with a green spot on the back, wings rose-purple, keel tinged with green; pods usually 2 or 3 inches long, sometimes more, sessile, containing 10 to 14 somewhat flattened seeds.

and produces many weak, leafy stems, which interlace in great tangled masses. The rather handsome, rose-colored flowers are borne in loose clusters and are followed by pods not unlike those of the common pea.

The wood pea is a native of Europe, and is most abundant in the central and southern parts, extending into northern Africa. It is found in thickets and hedgerows, and on rocky hillsides, blossoming throughout the summer. A variety has long been cultivated for ornament in English gardens under the name of everlasting pea.

HISTORY OF ITS INTRODUCTION.

In 1862, Herr Wagner, an agriculturist of Kirchheim-Teck in Würtemberg, Germany, had occasion to visit the Little Carpathian Mountains. There he observed that, while all other herbage had been burned up by the intense drought, the masses of stems and foliage of *Lathyrus sylvestris* remained green and tender. It occurred to him that here was a good fodder plant for dry soils, the more so as this luxuriant growth was upon pure chalk rubble. But when Wagner put the lathyrus to practical test, he found it wanting in two particulars. In the first place it contains certain alkaloids which render it disagreeable and injurious to cattle; in the second, the seed is protected by an exceedingly hard coat, so that it lies in the ground for years without germinating.

Thinking that possibly these apparently radical faults might be eliminated by cultivation, Wagner undertook the systematic improvement of the lathyrus. As a result the bitter alkaloids were gotten rid of, and the hard, vitreous seed coat was rendered comparatively soft and pervious to moisture, so that germination took place in two or three weeks, instead of as many years, after sowing. This alteration was accomplished by yearly transplanting, each time to a better soil.

While thus experimenting with the lathyrus, Wagner found that the plants seemed to obtain nitrogen wherewith to build up their protein, even when not manured. Indeed, he succeeded in getting a good crop upon a mound composed solely of fragments of hard sandstone, the lathyrus flourishing there for years without soil. At a meeting of the Hesse Farmers' Association, he described his results with the lathyrus, at the same time declaring that many leguminous plants, notably the wood pea, absorb free nitrogen directly from the air. He had not then observed what has since been asserted, that free nitrogen is assimilated only when the tubercles which occur upon the roots of many leguminous plants are present. These tubercles are remarkably abundant in species of lathyrus.

The improved variety of *Lathyrus sylvestris* thus brought into notice was named *Lathyrus sylvestris wagneri*, in honor of the cultivator. English agriculturists have named it "Flat Pea." It has received considerable attention in Germany, but has not yet been cultivated on an extensive scale. A great deal has been written about it, chiefly in

newspapers, not in the recognized agricultural journals. In England it has excited some interest. In the arid regions of Cape Colony its cultivation has been attended with seeming success. In the United States practical agriculturists have not yet taken it up to any great extent. Several of the State experiment stations, notably the Louisiana, Michigan, California, and Massachusetts stations have grown the flat pea in a small way and have made chemical analyses of it. In Louisiana the success of the experiment has so far not been marked, although the experimenter admits that there has not been time for a fair trial of it. At the Michigan Station quite favorable results have been obtained, the yield being good and cattle relishing the fodder. The United States Department of Agriculture has made no experiments with this lathyrus, but, owing to the wide advertising the plant is getting at the hands of seedsmen and newspapers, it has been thought best to issue the present circular, embodying all obtainable information concerning it.

USES.

Owing to its power of taking nitrogen from the air, and therefore of growing without the aid of nitrogenous manures when once well established, the flat pea is thought to be especially adapted to comparatively poor, sandy, shaly, or "chalky" soils. Hence its greatest value should be as a soil renovator, to restore nitrogen to ground which has been exhausted by cereals and like crops, or is otherwise lacking in sources of protein. This is a function largely delegated in the United States to the clovers and cowpeas. The lathyrus is said to be a good binder for drifting soils, the strong, fibrous, deep-penetrating roots forming a mesh which holds the particles of soil together. The roots are sometimes 20 to 30 feet long.

It is claimed that the hay of this lathyrus makes an excellent fodder, much relished by cattle, sheep, and swine, and contains more nutriment than most standard fodders. Some assert that the milk and butter, as well as the flesh of cattle fed upon this plant, are of superior quality. Owing to the high rate of nutritive matter in lathyrus hay, it is recommended that it be mixed with one-third or one-half of straw. At the Michigan Experiment Station it was found that cattle relished the green fodder, but no report is made of its effects upon them. A writer in Der Landbote, a German agricultural publication, informs us that a plantation of flat pea affords excellent "standing mast" for pigs, whose flesh is firmer and sweeter when fed upon it than when fattened with Indian corn. Game birds are said to thrive upon this food. We are informed that the flowers of the lathyrus are much frequented by bees, the honey from this source being exceptionally fine. Finally, as if enough had not been claimed for it, the seemingly extravagant assertion is made that the flat pea is an effective preventive for anthrax.

CHEMICAL ANALYSES.

Lathyrus fodder has been analyzed by German and English chemists, and at the California, Virginia, and Michigan State experiment stations. At Bonn, in Germany, the following results were obtained in an analysis of the dry fodder:

	Per cent.
Protein	30.25
Fat	8.55
Nitrogen-free extract	30.56

In England, Hope, taking the green plant after flowering, found:

	Per cent.
Water	58.63
Ash	3.09
Protein	7.44
Fiber	12.21
Fat	2.05
Nitrogen-free extract	16.58
	100

At the several experiment stations the results obtained are much alike. An analysis of air-dried hay at the Michigan Station yielded:

	Per cent.
Water	7.99
Crude ash	8.32
Ether extract, fat, etc	2.08
Crude fiber, woody matter	26.70
Nitrogen-free extract, starch, sugar, etc	27.74
Crude protein	[1] 27.17
	100

CULTIVATION.

The directions given by the German growers for the cultivation of the flat pea are not wanting in detail. Spring is considered the best season for sowing in Europe. At the Michigan Station the seed was sown in May. The seed should not be first sown in the field where it is intended to maintain a permanent crop, especially if the soil is poor, but in a starting bed. The latter should have a light and fertile soil, sandy or loamy ground being preferable. At germination and during their early growth the plants depend upon the soil for their supply of nitrogen, for it is not until they have developed strong roots, penetrating deeply into the subsoil, that they are able to take most of their free nitrogen from the air. If the land is not sufficiently fertile, guano or phosphates, but never stable manure, should be applied, care being taken that the roots are not in direct contact with the fertilizers.

The land having been well plowed, it is advisable to remove the top mold and loosen the subsoil to a depth of 2 or 3 feet. Then, the

[1] 14.36 per cent albuminoids.

top soil having been replaced, the seeds are sown in rows 12 or 13 inches apart and at a depth of from $\frac{3}{4}$ to $1\frac{1}{2}$ inches. It is well to roll the ground lightly after sowing. As the ground must be kept free from weeds during the first season, and as the seeds require two or three weeks for germination, it is well to mark the rows by sowing rape or turnips upon them, these to be pulled up, of course, when no longer needed. It is said that 67 pounds of seed to the acre in this starting bed will produce plants enough for twelve acres.

Either in the fall or in the spring following, as seems best to the cultivator, the young lathyrus plants should be transferred to the field where the permanent plantation is to be made. Before transplanting in the autumn the top growth should be mowed, but if it is intended not to transplant them until spring, the mowing should be omitted. When taken up, and just before replanting, the roots are to be cut off evenly with knife or shears to a length of 8 or 10 inches. They should then be set out 10 or 12 (others say 14 or 16) inches apart. They should be planted only in alternate furrows, the furrows between being used to cover the others. The soil should be packed down about the plants so as to thoroughly protect the root and the base of the stem. It is estimated that about 30,000 plants are needed for an acre. The field into which the plants are transplanted should first be thoroughly plowed and the subsoil loosened with a subsoil plow. Where the soil is hard and stony, the plants should be set in comparatively large holes, the roots being covered with fine soil.

FIG. 2.—Seedlings of *Lathyrus sylvestris wagneri*.

The flat pea will flourish upon almost any soil, provided it is dry. Water within 13 feet of the surface, however, renders the ground unfit for this plant. A light soil, sandy, or even gravelly, through which the roots pass readily, is most favorable.

It is well to give the crop a thorough hoeing once in the spring of the second year. As a general thing, no further cultivation will be

required. The luxuriant vegetation of the lathyrus itself will choke out weeds. The application of fertilizers after the plants are well developed is a waste of time and money, as the roots go so deeply into the subsoil that surface manures will not reach them. The crop should not be mowed until the third year. Then it may be cut as often as it is ready to flower.

RATE OF GROWTH.

At the Michigan State Experiment Station it was found that the plants did not bloom the first season and bore but few flowers and pods during the second. At the substation at Grayling, Mich., a top growth of 6 to 8 inches and a root growth of 12 to 14 inches was made in the first year upon "very poor, unimproved, sandy soil." At the main station plants sown in deep muck grew the first season to a height of 12 to 15 inches and sent out roots 24 inches long. Afterwards, owing to the excessive moisture of this soil, little growth was made. In the following year plants sown on good sandy soil made a growth in both directions equal to that made upon muck the year before. The roots were abundantly supplied with large tubercles. Two-year-old plants had stalks 3 feet long by the middle of July of the second year. At the Massachusetts Station an upward growth of only 4 inches by September 19 was obtained from seeds sown May 15. But the seed used was "not the best kind." When once established, plants mature and ripen seed in about five months. At the Michigan Station, in the second year, a square rod of plants yielded on July 12 at the rate of 16 tons of green fodder and 4 tons of cured hay per acre. The average yield of hay per acre is said to be 3 tons; of seed, 130 to 220 pounds.

At the Michigan Station it was found that the plants resisted frost, remaining green until late in the fall. They endured the winter well, and commenced to grow again in April. At the Louisiana Station the seed was sown in the fall and made small growth during the winter. In the spring the plants had still to be protected. It was found that, unless carefully weeded out, native herbage soon choked the lathyrus.

CONCLUSION.

It may be said, in summing up, that many of the claims advanced for the lathyrus are "not proven," and that some of the assertions made in regard to it are improbable or even absurd. Yet there is reason to believe that the plant may have real value for fodder. In order to establish this, more extensive cultivation by unprejudiced growers is needed. The results obtained at the experiment stations are doubtless to be relied on as far as they go, but they are not conclusive as regards large crops, nor for any of those questions requiring a period of years to determine. The great labor involved in getting the plants started is a serious objection to the cultivation of the lathyrus. On the other hand, it may be said that when once fairly started the plants live many

years and require no cultivation after the spring of the second season. The flat pea has apparently succeeded in the arid regions of Southern Africa, and may prove an efficient ally of the farmer in the similar regions of the Southwestern States. Owing to its deep, tenacious roots and perennial habit it is not adapted to use in rotation, although by reason of its great nitrogen-accumulating power and ability to resist drought, it may prove valuable as a soil renovator in arid tracts where the plants commonly employed for that purpose will not grow. Hence, if it should not be found profitable to maintain the lathyrus as a permanent fodder crop, it may be made to serve as a soil restorer by plowing under after two or three years.

Finally, it must be borne in mind that this plant, naturally growing upon sterile ground, was improved by continual transplanting to better soil. If sown upon poor soil, is there not danger that it will revert to its original state, regaining the injurious qualities lost in the course of improvement? The method of its improvement—by continual transplanting to better soil—makes the probability of reversion great. Indeed, those who advertise the plant most extensively admit that many who raise seed for sale have, on account of careless cultivation, placed on the market seed of inferior or unimproved forms. Unless this can be stopped it is to be feared that the result will be the entire reversion of the improved variety.

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Approved:

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